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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/971,095	10/03/2001	Igal Ladabaum	016132 0274779 SC-007(U)	2110

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Pillsbury Winthrop, LLP
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Palo Alto, CA 94304

EXAMINER

LOBO, IAN J

ART UNIT	PAPER NUMBER
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3662

DATE MAILED: 09/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/971,095

Applicant(s)

LADABAUM ET AL.

Examiner

Ian J. Lobo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 July 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) 9-18 and 27-36 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 19-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 10. 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-8 and 19-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over any one of the patents to Ladabaum et al ('351, '452, '709), Haller et al ('476, '832) or article Ladabaum et al when taken in view of Horner et al ('652), Swierkowski ('580), Goll ('091) and Carson et al ('163).

The prior art Micromachined Ultrasonic Transducers (MUTs) are adequately disclosed in the patents to Ladabaum et al, Haller et al or article to Ladabaum et al. Specifically, the MUTs include a plurality of MUT cells located on a first surface of a substrate (silicon). MUTs include a substrate (silicon) having a top and backside, and a microfabricated acoustic transducer formed on the topside of the substrate. The instant claims are directed to similar micromachined ultrasonic transducer structures.

The difference between claims 1 and 19 and the above noted MUTs (and method for forming such) is the claims specify a damping material located on the backside of the substrate and placing a damping material on the backside of the substrate,

respectively. Further, both claims include the limitation that the damping material has an acoustic impedance substantially equal to that of the substrate.

The patent to Horner et al teaches that it is well known to utilize acoustic backing or damping materials to attenuate or absorb noise or reverberations in ultrasonic transducers. Some of the acoustic absorbers or dampers include elastomers, silicon rubbers and RTV materials. Further, on col. 3, lines 3-50, Horner et al suggests that groups of mixtures have been found to offer exceptional attenuation characteristics. The group includes silicon rubbers that are loaded with metal powders such as tungsten. Swierkowski discloses a micromachined device (not unlike the MUTs disclosed above) where a substrate (10) is abutted with acoustic damping or absorption layer (46). The patent to Goll teaches (col. 2, lines 36-60) that silicon rubber loaded with tungsten powder is a good lossy damping material that also has the same acoustic impedance as the substrate (in this case silicon). The patent to Carson et al teaches (col. 10, lines 17-25 and claim 12) that having a damping material with acoustic impedances the same as the piezoelectric substrate abutted thereon makes the transducer responsive to a broader range of frequencies.

Thus, in view of Horner et al and Swierkowski, one of ordinary skill in the art would look to modify the prior art MUTs by disposing an acoustic absorbing or damping material (silicon rubber loaded with tungsten powder) on the backside of the silicon substrate from the capacitive elements since such a damping layer would attenuate echo reverberations. The use of silicon rubber loaded with tungsten powder provides exceptional attenuation characteristics, as suggested by Horner et al, and is inherently

of the same acoustic impedance as the silicon substrate, as taught by Goll. Further, as a further motivation for using silicon rubber loaded with tungsten powder as a damping material abutted on the backside of the silicon substrates, Carson et al teaches that the transducer is provided with a broader range of frequency responsiveness. Claims 1 and 19 are so rejected.

Dependent claims 2-8 and 20-26 are further provided by the above noted combination of prior art.

Response to Arguments

3. Applicant's arguments filed July 16, 2003 have been fully considered but they are not persuasive.

Applicants mainly argue that at the time of the invention, acoustic damping for specific "substrate modes" in MUT's was not contemplated because such substrate modes were not known to exist and therefore such their damping, not contemplated. However, it is argued that, MUT's are a type of acoustic transducer. As evidenced by the large body of art in noise suppression for acoustic transducers, all acoustic transducers suffer from some type of noise. The prior art MUTs are a specific type of ultrasonic transducer wherein ultrasonic waves are transmitted and/or received along a specific front radiative surface or edge of the transducer. The secondary reference to Horner et al (col. 1, lines 17-32) teaches that ultrasonic transducer structures suffer from noise or reverberations or interfering waves traveling along surfaces edges other than those used for transmission and/or reception. Horner et al suggests utilizing

acoustic absorption layers or acoustic absorption materials adhered to the surfaces or edges other than the transmission and/or reception surface or edge. Such an absorption layer or material would effectively attenuate such reverberations or noise. Swierkowski teaches that adhering an acoustic absorption layer or material to the surface of the substrate other than the radiative surface (backside) is known. Thus, in view of Horner et al, it would have been obvious to a skilled artisan in the field of ultrasonic transducers to modify the prior art MUT's by adhering an absorption layer or material to the surface of the substrate other than the radiative surface so as to attenuate the noise or interfering waves are common in ultrasonic transducers, of which MUTs are part of. Such a modification would be one of ordinary skill since Swierkowski teaches that micromachined ultrasonic transducers (MUTs) are known where the substrates are adhered to an absorption layer or material. The specific damping materials and their characteristics are taught by Goll and Carson et al to include materials that have an acoustic impedance similar to the substrate.

Conclusion

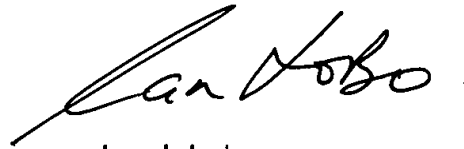
4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ian J. Lobo whose telephone number is (703) 306-4161. The examiner can normally be reached on Mon - Fri, 6:30 - 3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas H. Tarcza can be reached on (703) 306-4171. The fax phone

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number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1113.

A handwritten signature in black ink, reading "Ian J. Lobo". The signature is fluid and cursive, with a long horizontal stroke at the beginning and a small dot at the end.

Ian J. Lobo

Primary Examiner

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ijl